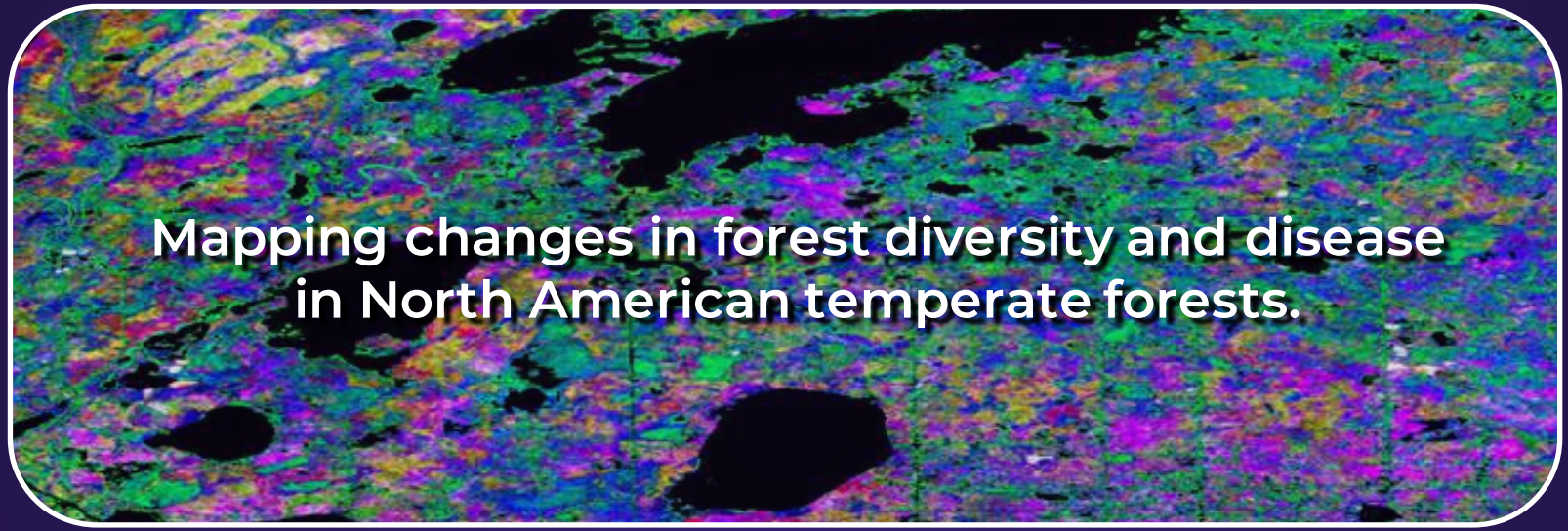


Mapping changes in forest diversity and disease in North American temperate forests.

J. Antonio Guzmán Q., Jeannine Cavender-Bares (PI), Philip A. Townsend, Jesús N. Pinto-Ledezma, Jennifer Juzwik, Gerard Sapés , Jonathan Knott.

guzman@umn.edu

Carbon Cycle and Ecosystems – Joint Science Workshop
May 8th – 12th College Park, Maryland

University of Minnesota
Driven to Discover℠

Project goals

Project goals (summary):

1. Model species distributions using remote sensing data as input variables.
   - ✓ Pinto-Ledezma and Cavender-Bares (2021) *Scientific Reports*.
2. **Scale forest diversity detection to map communities using satellite imagery**.
3. **Identify and differentiate threats to oaks species.**
   - ✓ Sapés et al. (2022) *Remote Sensing of Environment*.

Jeannine Cavender-Bares (PI)

Philip A. Townsend

Jesús N. Pinto-Ledezma

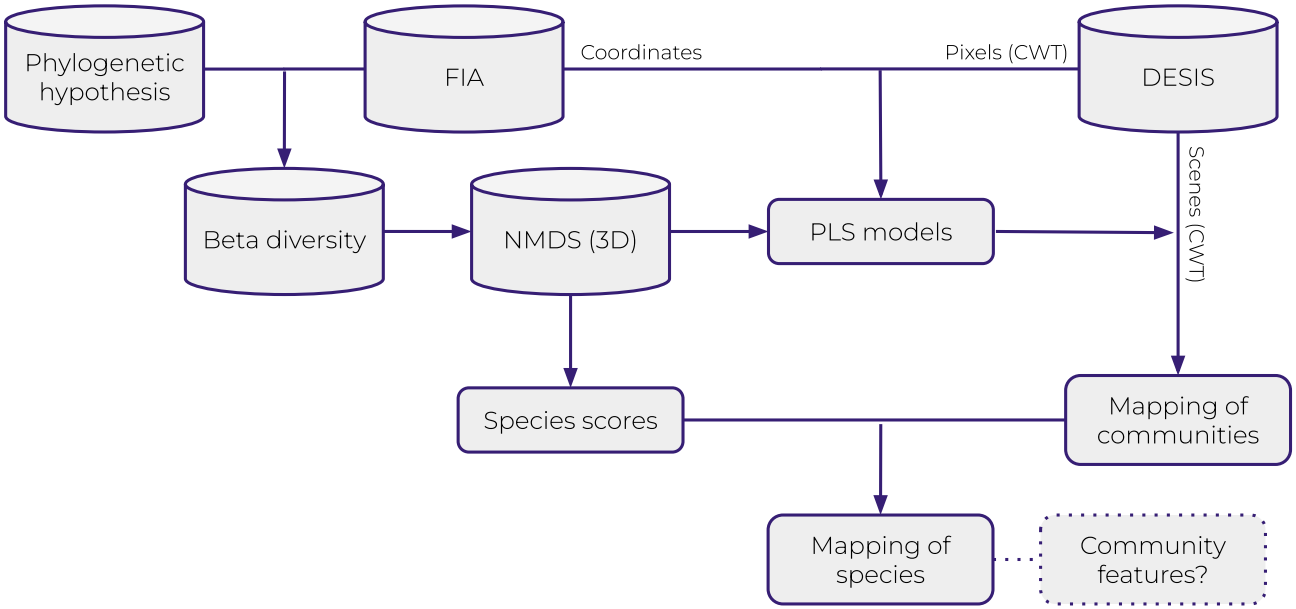
Gerard Sapés

Jennifer Juzwik

Jonathan Knott

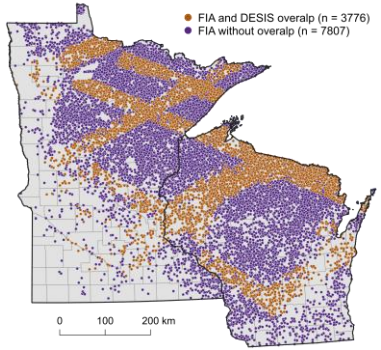
Mapping of forest communities

We are developing an approach to map forest communities by integrating forest inventories, phylogenetics, and space-borne spectroscopy

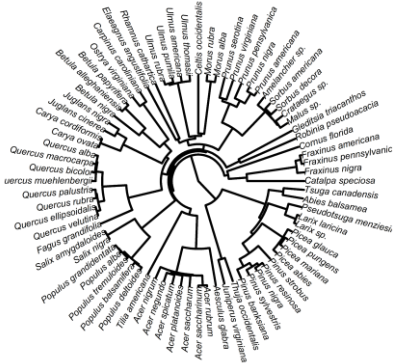


Schematic workflow for integrating phylogenetic beta diversity with spaceborne spectroscopy

Mapping of forest communities

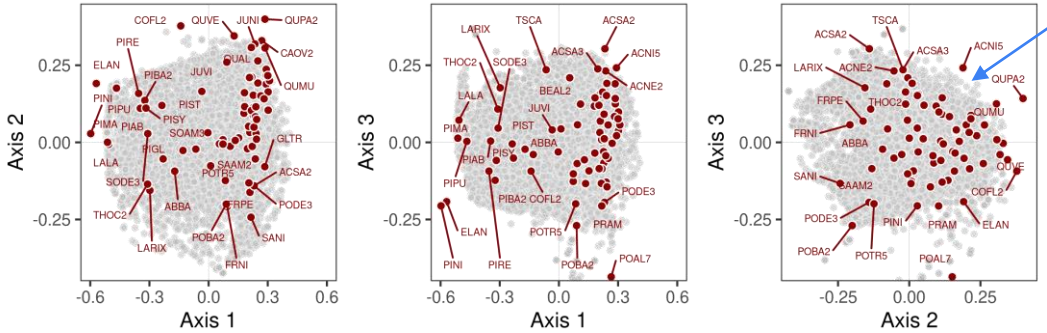


FIA plots



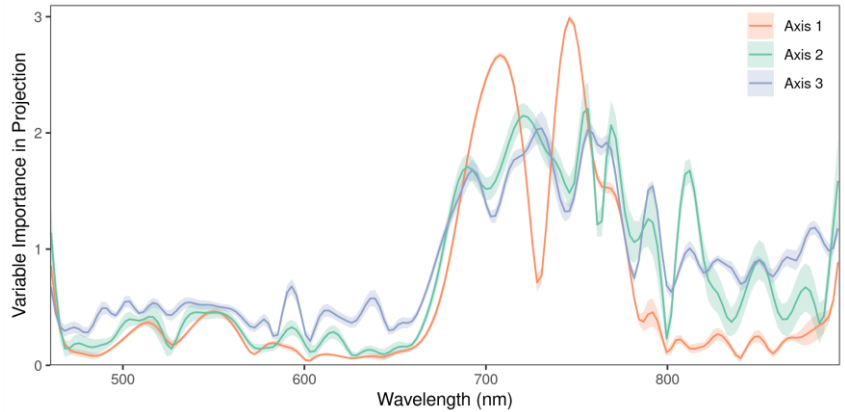
Phylogeny of tress
(72 species)

Phylogenetic beta diversity

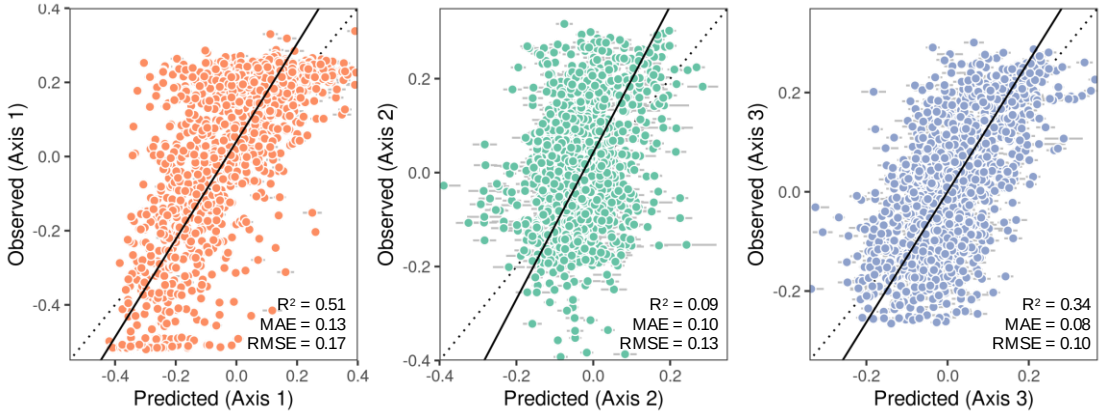


Non-metric Multi-Dimensional Scaling of phylogenetic beta diversity

Mapping of forest communities



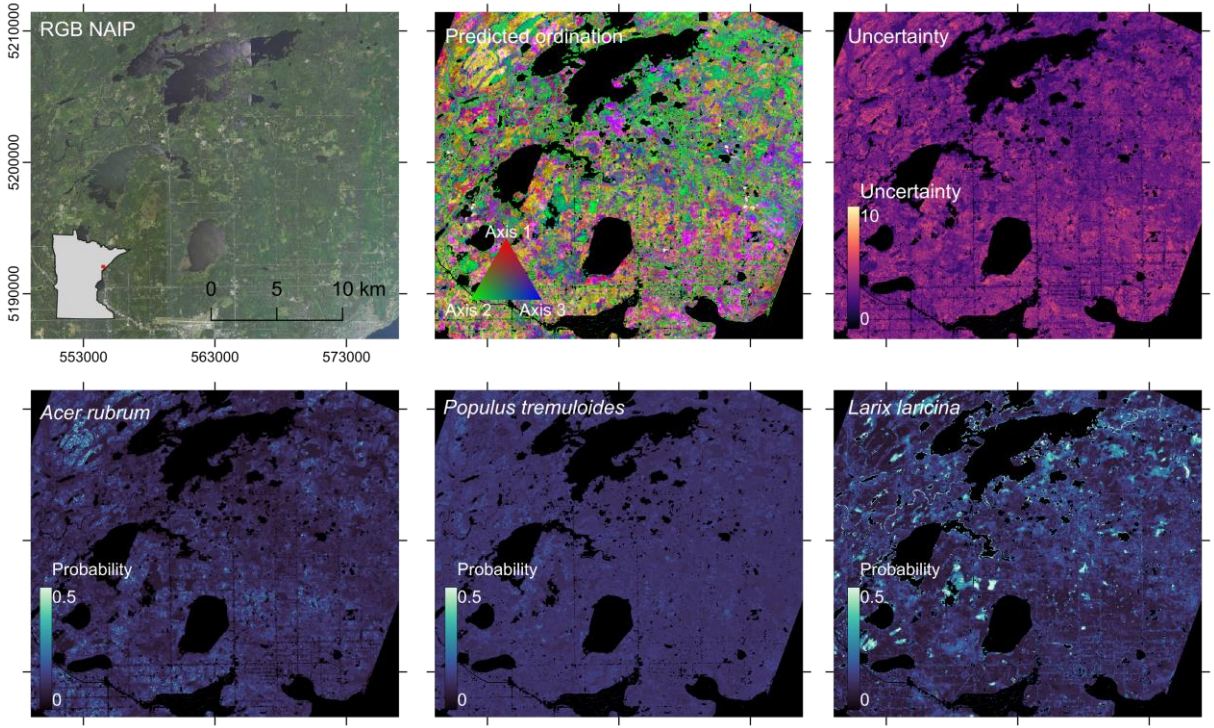
Variable importance of spectral bands that predict the NMDS axes.



Relationships between observed and predicted NMDS axes.

Mapping of forest communities

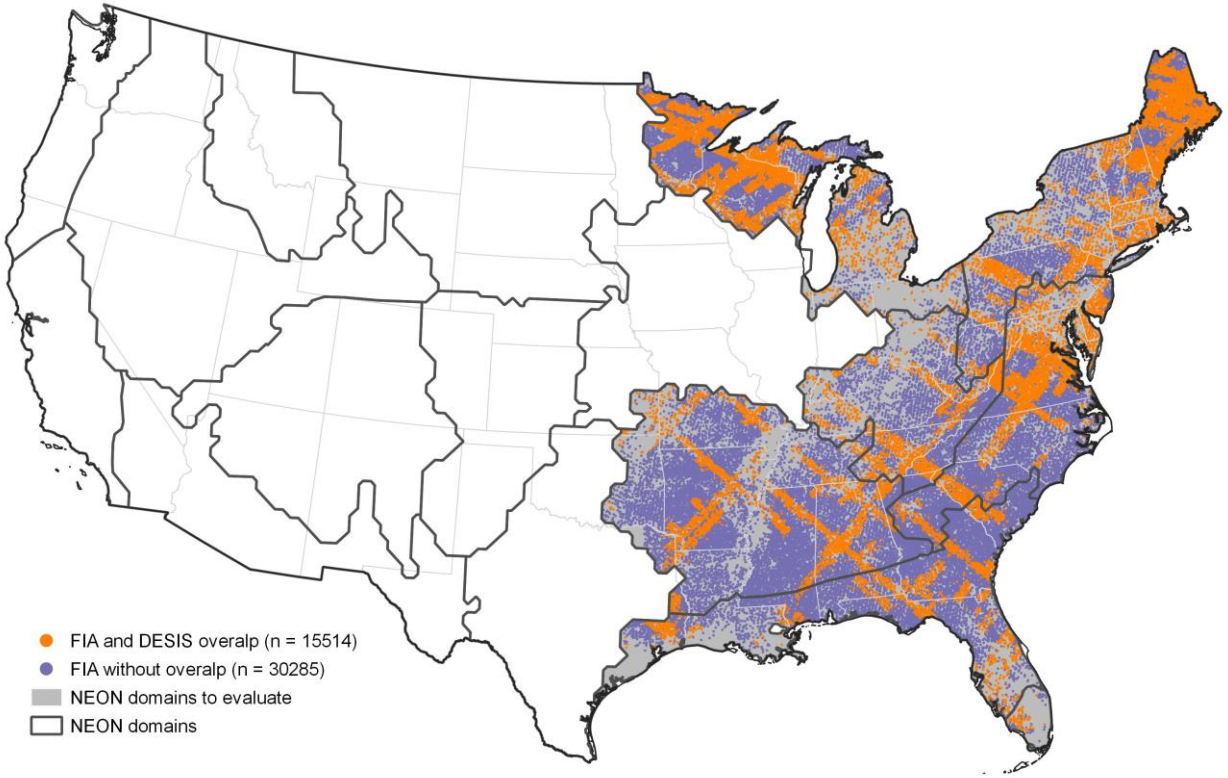
Prediction of the phylogenetic beta ordination axes for tree communities allows approximation of species occurrences



Mapping of the three community ordination axes (top middle panel) and the approximate species occurrences predicted from these models (bottom panels).

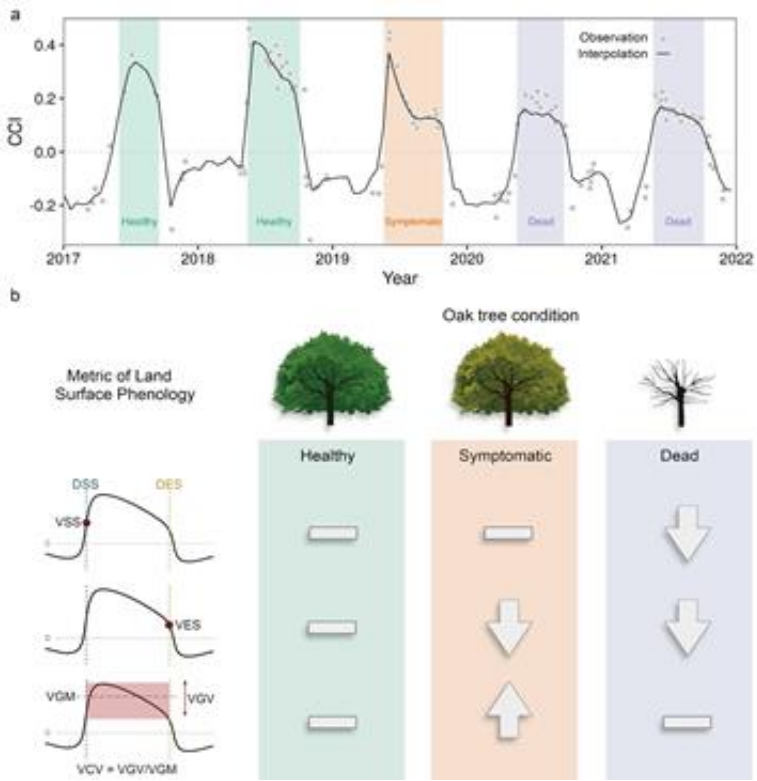
Mapping of forest communities

We are expanding our approach across Eastern US forests



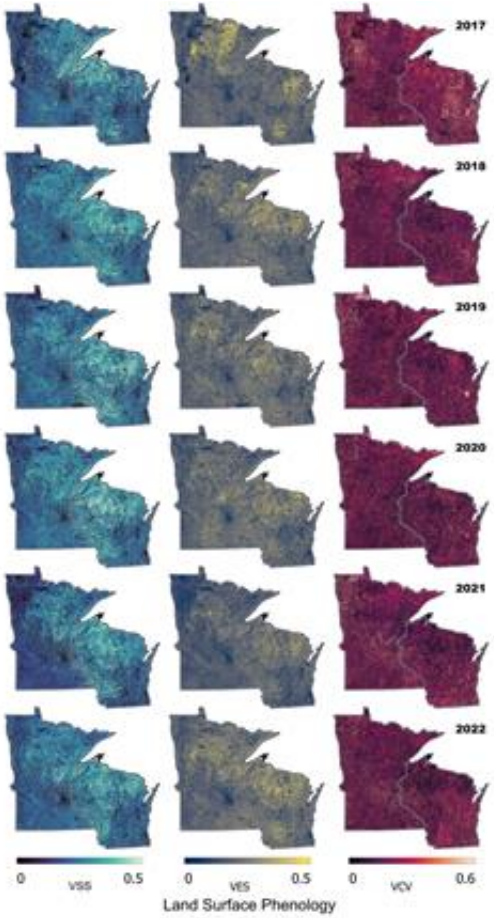
Mapping of tree disease: oak wilt

We have established that metrics of land surface phenology can be used as indicators of tree disease



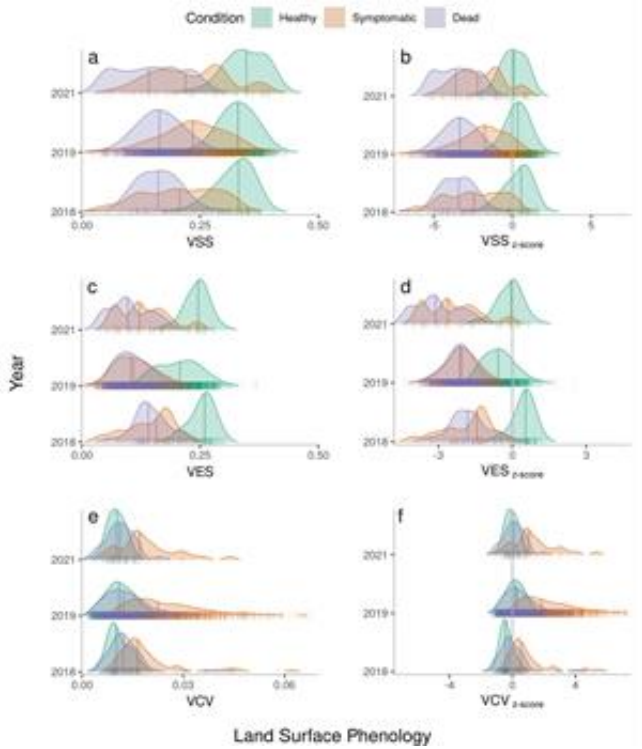
Schematic representation of how metrics from land surface phenology can be used to infer the presence of oak wilt

Mapping of tree disease: oak wilt



Land surface phenology across Minnesota and Wisconsin derived from Sentinel-2

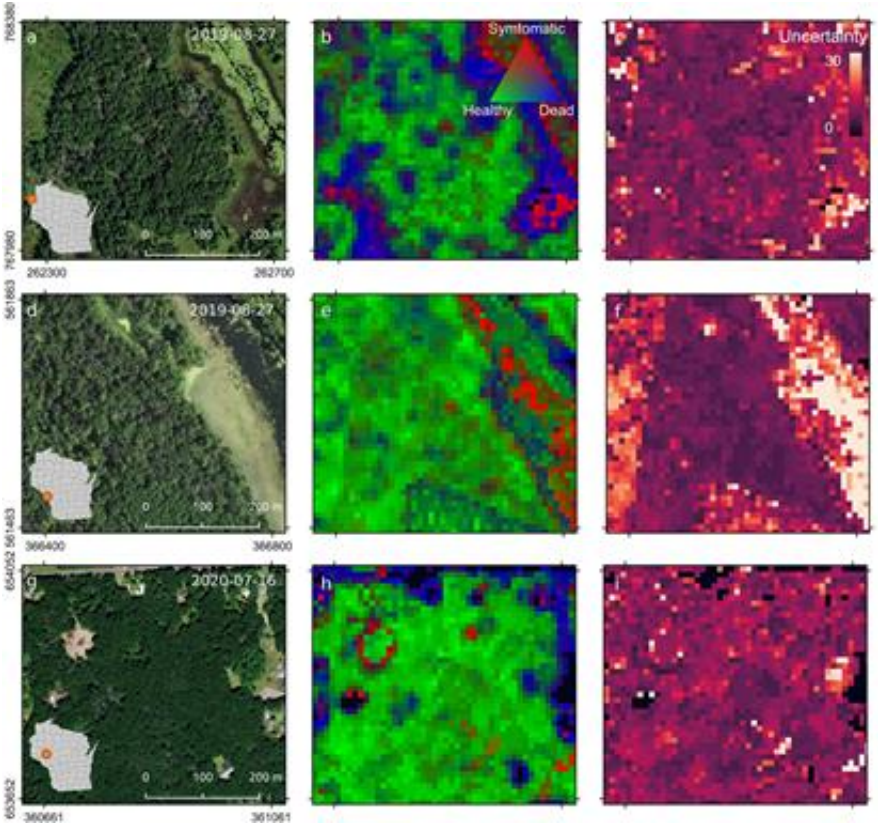
We use land surface phenology to infer oak wilt disease in oak trees



Land surface phenology among oak tree conditions

Mapping of tree disease: oak wilt

We created maps of the probability of oak wilt disease for both states



Oak wilt status for three sites in western Wisconsin. Panels represent NAIP RGB (left), probability maps (middle), and their uncertainty (right)

Thank you!

J. Antonio Guzmán Q., Ph.D
Department of Ecology, Evolution and Behavior
University of Minnesota, US
guzman@umn.edu

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Jeannine Cavender-Bares (PI)